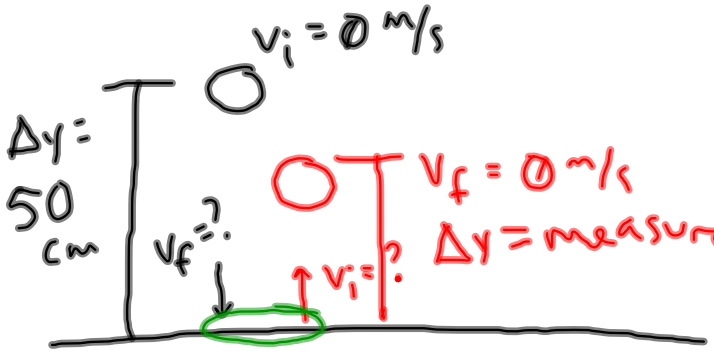
Golf Ball Impulse lab:



$$v_f^2 = v_i^2 + 2a_g\Delta y$$

$$v_f^2 = v_i^2 + 2a_g\Delta y$$

$$v_f = \sqrt{2a_g\Delta y}$$

$$v_i = \sqrt{-2a_g\Delta y}$$

need to have opposite signs

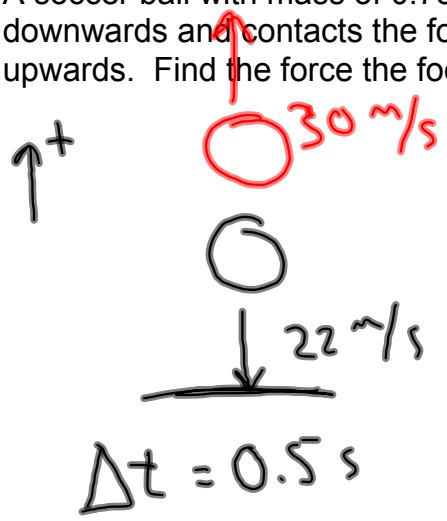
$$F\Delta t = m\Delta v$$

$$F = \frac{m(v_f - v_i)}{\Delta t}$$

$m = 0.05$ kg

Δt = measured value

A soccer ball with mass of 0.75 kg approaches a player's foot at a velocity of 22 m/s downwards and contacts the foot for 0.5 s. It leaves the foot with a velocity of 30 m/s upwards. Find the force the foot and ball experience.



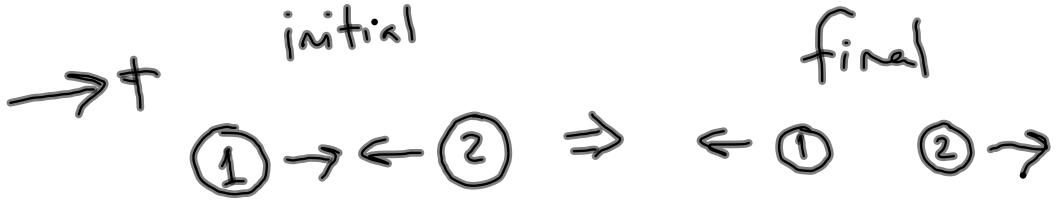
$$\bar{F}\Delta t = m\Delta\bar{v}$$

$$\bar{F} = \frac{m(\bar{v}_f - \bar{v}_i)}{\Delta t}$$

$$= \frac{(.75\,kg)[30\,m/s - (-22\,m/s)]}{.50\,s}$$

$$= 78\,N$$

Ball 1 has a mass of 10 kg and is moving initially at 10 m/s to the right. After it collides with ball 2, it has a velocity of 3 m/s to the left. Ball 2 is moving initially at 17 m/s to the left, and after it collides with ball 1 it has a velocity of 22 m/s to the right. Find the mass of ball 2.



$$\vec{p}_{1i} + \vec{p}_{2i} = \vec{p}_{1f} + \vec{p}_{2f}$$

$$m_1\vec{v}_{1i} + m_2\vec{v}_{2i} = m_1\vec{v}_{1f} + m_2\vec{v}_{2f}$$

$$m_2 v_{2i} - m_2 v_{2f} = m_1 v_{1f} - m_1 v_{1i}$$

$$m_2 (v_{2i} - v_{2f}) = m_1 v_{1f} - m_1 v_{1i}$$

$$m_2 = \frac{m_1 v_{1f} - m_1 v_{1i}}{v_{2i} - v_{2f}}$$

$$= 3.33 \text{ kg}$$

Momentum Review and Practice Problems 4th Block 10.12.11

A 75 kg person is holding a bow and arrow (arrow has mass of .5 kg) and standing on a frictionless surface. When fired, the arrow has a velocity of 45 m/s.
a) Find the velocity of the person.
b) Find the force the person experiences if the time it takes for the arrow to be fired is 0.25 s.

→ +

a)

$$(m_a + m_p)\bar{v}_i = m_a\bar{v}_{af} + m_p\bar{v}_{pf}$$

$v_i = 0$ m/s

$$m_a v_{af} = -m_p v_{pf}$$

$$v_{pf} = \frac{-m_a v_{af}}{m_p}$$

$$= -\frac{(.5\text{ kg})(45\text{ m/s})}{75\text{ kg}}$$

$$= -0.3\text{ m/s}$$

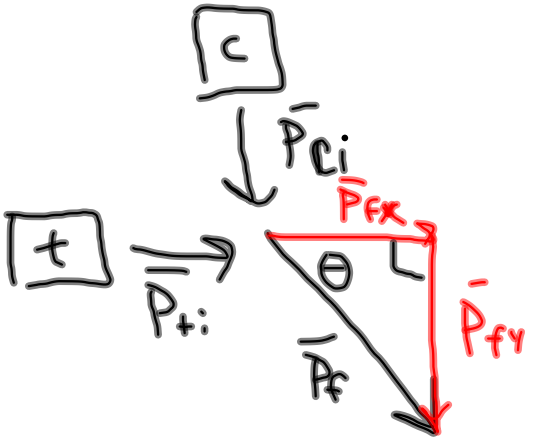
b) $\bar{F}\Delta t = m\Delta\bar{v}$

$$\bar{F} = \frac{m_p(v_{pf} - v_{pi})}{\Delta t}$$

$$= \frac{(75\text{ kg})[-0.3\text{ m/s} - 0\text{ m/s}]}{.25\text{ s}}$$

$$= -90\text{ N}$$

A 1800 kg car is traveling south with a velocity of 30 m/s and a 2200 kg truck is traveling east with a velocity of 21 m/s. If the car and truck collide and stick together, find the final velocity of the combined mass.



x: $\bar{P}_{ix} = \bar{P}_{fx} = \bar{P}_{ti}$

y: $\bar{P}_{iy} = \bar{P}_{fy} = \bar{P}_{ci}$

$P_{ti} = 46\,200 \text{ kg}\cdot\text{m/s}$

$P_{ci} = 54000 \text{ kg}\cdot\text{m/s}$

Pythagorean thm:

$P_f = 71066 \text{ kg}\cdot\text{m/s}$

$\theta = 49.5^\circ$ S of E

$\bar{P}_f = m\bar{V}_f$

$M = m_c + m_t$

$= 4000 \text{ kg}$

$V_f = \dfrac{71066 \text{ kg}\cdot\text{m/s}}{4000 \text{ kg}}$

$= 17.7 \text{ m/s}$

Ball 1 (mass = 5 kg) approaches a stationary ball 2 (mass = 8 kg) with a velocity of 35 m/s. The first ball leaves the elastic collision with an angle of 28 degrees, and the second ball leaves the collision at an angle of 62 degrees. Find the final velocity of both ball 1 and ball 2.